Remarks:

General:

The Applicant has amended the title, specification, claims, and abstract of Patent Application Number 09/784,773 to conform with the Office Action mailed April 2, 2002, and with the Office Action mailed August 7, 2002.

The laser diode arrays and other elements presented in this Amendment B are merely a clarification and expansion of intent and concepts presented in the original application and references (original and O.As.) and do not, in the view of the Applicant, constitute "new" technical material.

The term "SUBMILLIMETER IMAGE SWITCHES" is descriptive and not intended to be restrictive. A "submillimeter alphanumeric image switch" would also be a "submillimeter image switch". Static, submillimeter image switches would have unchanging symbols or scenes on the switching elements. Dynamic, submillimeter image switches would have the ability to change the symbols or scenes on the switching elements, e.g. liquid crystal switching elements and the like.

Current optronic/photonic system laser technology employs lasers with a wavelength of approximately 1.5 microns (10-6 meters). This would be the lower limit of submillimeter image switch resolution using current technology, i.e. information symbols or scenes on submillimeter image switch elements would be about 1.5 microns or larger in size (up to about 0.5 millimeters).

In a manner of speaking, motion picture projectors, still-slide projectors, TVs, displays (real/virtual), and the like, are image switching devices. These images can range from very large (I-Max) to very small (microdot). These projectors/screens can range from centimeters to meters in size.

In the Applicant's opinion, submillimeter image switching devices based on MEMS switches and laser diode arrays and the like (and the technology involved) are unique and novel devices, these are submillimeter switch elements and images, and centimeter sized devices. These submillimeter images would be machine operable and would need to be enlarged several times to be human observable.

A switch is commonly defined to have two possible states, either on or off. Submillimeter image switches expand the envelope of switch definitions. The submillimeter image switch embodiment described in "Objects and Advantages", with 256 switch elements would have 256 possible single states, or , if combinations are allowed, the possible number of states becomes very, very large. Such a device might be named an "optitch", for optical image switch.

References:

The red, blue and green color switching disclosed by Sakuma et al., U.S. Patent 6,292,305 B1, column 21, lines 3 - 64 et al., to create the illusion of a color image, does not appear to anticipate "SUBMILLIMETER IMAGE SWITCHES".

Tanaka et al., U.S. Patent 5,754,712 column 8, lines 37, 50 - 67 et al., apparently describes binary, on/off, switches and does not appear to anticipate "SUBMILLIMETER IMAGE SWITCHES".

"The scanning device ... having characteristic dimensions on the submillimeter range." disclosed by Johnson, U.S. Patent 5,673,139, Fig. 1, Fig. 2 and Fig. 20 -25 does not show any attempt or concept to create, form, or etch submillimeter information symbols or scenes onto the optical surfaces i.e. switch elements; and does not appear to anticipate "SUBMILLIMETER IMAGE SWITCHES".

"SUBMILLIMETER IMAGE SWITCHES" and the referenced articles and patents appear to describe all of the elements necessary to develop prototype information systems/networks of submillimeter image optronic/photonic devices.

The potential increase of information transfer rates by submillimeter image switches in optronic/photonic devices and/or systems/networks over binary code systems/networks would seem to make submillimeter image switch based optronic/photonic devices and/or systems/networks useful.

For Examiner's use only:

Marked up version of specification (excluding Claims and Abstract) in Amendment B of Application # 09/784,773.

[a marked up version with all of the original material of the specification of record underlined, with Amendment A material in plain text, and with deletions shown as interline cross-outs, ~~deleted~~ *and with Amendment B additions in italics;* for the Examiner's use only.]

Title: ~~MINUSCULE IMAGES OF ALPHANUMERIC SYMBOLS~~ SUBMILLIMETER IMAGE SWITCHES

Specification:

Background - Field of Invention:

[0001] This invention relates to switches and to the use of *submillimeter* ~~-alphanumeric-~~ information symbols or scenes on MicroElectroMechanical System (MEMS) mirrors and/or on the exit mirrors of laser diode arrays and the like. *Definition: " image " defined as the pattern or form or relative position of photons in an optical pulse, beam or front as it moves through space, optical fibers and the like. These " images " become visible when the photons encounter a surface or are displayed, this is, also, commonly called an image.*

Background - Prior Art:

[0002] The use of binary switches and the resulting binary code have required that relatively long at code strings be used to represent or transmit simple symbols. *The output or product of " SUBMILLIMETER IMAGE SWITCHES " could be a stream (string) of very short (femtosecond) laser pulses, small enough (submillimeter diameter or cross section) to be*

carried on optical fiber systems. Each laser pulse being a discreet, separate, submillimeter image of information symbols or scenes and the like.

[0003] *The following four patents: Sakuma et al., U.S. Patent #6,292,305 B1; Betensky et al., U.S. Patent#5,745,301; Tanaka et al., U.S. Patent#5,754,712; and Braat, U.S. Patent#6,317,276 B1; disclose operations on images, respectively: display; demagnification; searching, storing and displaying; writing and/or reading. They do not create the image signal or image input. The creation of the image signal or image input as submillimeter images would be the purview of " SUBMILLIMETER IMAGE SWITCHES ".*

[0004] Sakuma et al., U.S. Patent # 6,292,305 B1 disclose a virtual screen display apparatus and ... a relatively small image display for displaying characters or image information... [apparently of a size to be human observable] or

"Means to create minuscule alphanumeric images by reflection and by/in the light pulse, for presentation on a real or virtual display screen" (from 2002, April 2 O.A.). *As shown in Fig. 15,(Sheet 15 of 20, lower left) and described in Column 1, Lines 5-10 this device displays images which are created by an output device. The creation of these images would be the purview of " SUBMILLIMETER IMAGE SWITCHES ", an output device.*

[0005] Lens systems to produce small images of varying magnification for detection by an electronic imaging system or "Lens systems for producing small images" (from 2002, April 2 O.A.) are disclosed by Betensky et al. (U.S. Patent 5,745,301).

[0006] An image processing apparatus for searching, storing, and displaying characters, sentence fragments, sentences or documents or "A device for searching any character string of a sentence input as an image" (from 2002, April 2 O.A.) is disclosed by Tanaka et al. (U.S. Patent 5,754,712).

[0007] An optical lens system and scanning device for reading and/or writing information in an information plane or "An optical scanning device for reading and writing information in an information plane" (from 2002, April 2 O.A.) is disclosed by Braat (U.S. Patent 6,317,276 B1).

[0008] The absolute/unique distinction between, the four patents referenced above (Sakuma et al., Betensky et al, Tanaka et al., and Braat) and "SUBMILLIMETER IMAGE SWITCHES", can be demonstrated by reference to Sakuma et al., U.S. Patent 6,292,305 B1, Sheet 15 of 20, FIG. 15. In the lower left corner of FIG. 15 is the term "IMAGE SIGNAL", to the left of that would be the purview of "SUBMILLIMETER IMAGE SWITCHES".

[0009] The same distinction would apply to the other three patents: Tanaka et al., U.S. Patent 5,754,712, Sheet 1 of 23, FIG. 1, upper left, "IMAGE INPUT UNIT", above that would be the purview of "SUBMILLIMETER IMAGE SWITCHES".

Betensky et al., U.S. Patent 5,745,301, ABSTRACT, First sentence, "Variable power lens systems for use with electronic imaging systems, e.g. systems employing CCDs, are provided." , would be synergistic with the purview of "SUBMILLIMETER IMAGE SWITCHES".

Braat, U.S. Patent 6,317,276 B1, ABSTRACT, Last sentence, "This lens system is very suitable for a scanning device and an apparatus for reading/writing high-density optical discs." , would be synergistic with the purview of "SUBMILLIMETER IMAGE SWITCHES".

[0010] "SUBMILLIMETER IMAGE SWITCHES" would likely be synergistic with OCR equipment.

[0011] *The prior four patents refer to operations performed on images which could be created, or produced by " SUBMILLIMETER IMAGE SWITCHES ".*

[0012] *"An electrically actuated microelectromechanical television scanning device for television image scanning or related functions. The scanning device can be produced in forms having characteristic dimensions in the submillimeter range. ..." is disclosed by Johnson (U.S. Patent 5,673,139). This patent does not show or infer any attempt or concept to create, form or etch, submillimeter information symbols or scenes onto the switch elements, i.e. optical surfaces (mirrors, laser diode exit mirrors, liquid crystal elements, or the like). Hence, Johnson, U.S. Patent 5,673,139, does not anticipate "SUBMILLIMETER IMAGE SWITCHES'.*

[0013] *A "... light-actuated photonic switch is disclosed..." by Aksyuk et al., U.S. Patent 6,075,239. This patent does not describe any attempt or concept of creating, forming or etching submillimeter information symbols or scenes onto the switch elements, i.e. optical surfaces (reflectors, mirrors, or the like). Hence, Aksyuk et al., U.S. Patent 6,075,239, does not anticipate " SUBMILLIMETER IMAGE SWITCHES ".*

[0014] *" A cross-connect switch for fiber-optic communication networks employing a wavelenght dispersive element, such as a grating, and a stack of regular (non-wavelength selective) cross bar switchs using two-dimensional arrays of micromachined, electrically actuated, individually-tiltable, controlled deflection micro-mirrors for providing multiport switching capability for a plurality of wavelengths. ... " is disclosed by Solgaard et al., U.S. Patent 6,389,190 B2. The word " image " is used in several places in Column 2, it is clear ,from the context, that the meaning is to position or focus the optical beams onto mirrors or fiber ends. This patent does not describe any attempt or concept of creating, forming, or etching submillimeter information symbols or scenes on the switch elements, i.e. optical surfaces (micro-mirrors, gratings, or the like). Hence, Solgaard et al., U.S. Patent 6,389,190 B2, does not anticipate " SUBMILLIMETER IMAGE SWITCHES ".*

[0015] *These patents: Johnson, U.S. Patent 5,673,139 , Aksyuk et al., U.S. Patent 6,075,239, and Solgaard et al., U.S. Patent 6,389,190 B2, are likely to be synergistic with " SUBMILLIMETER IMAGE SWITCHES ".*

[0016] *The unique, enabling paradigm of " SUBMILLIMETER IMAGE SWITCHES " is the creation, formation or etching of submillimeter information symbols or scenes onto the optical surface(s) of MEMS mirrors, exit mirrors of laser diode arrays, submillimeter liquid crystal displays, and the like; and the creation of submillimeter optical images of these submillimeter information symbols or scenes with very short pulses, of submillimeter dimension (diameter, etc.), of laser light; and the selective switching of these laser pulses to create a string of submillimeter images. The prior patents do not infer, suggest, or describe this paradigm.*

Objects and Advantages:

[0017] Submillimeter information, including scenes and/or alphanumeric symbols, on the mirrors of MEMS switches, and/or the exit mirrors of laser diode arrays and the like, allow the representation, switching and/or transmission of ~~-symbol-~~ submillimeter images with very short pulses of laser light.

[0018] One embodiment, an array of 256 submillimeter image switch elements (MEMS mirrors, laser diode arrays and the like) with submillimeter alphanumeric symbols on each switch element could function as an submillimeter alphanumeric image string switch.

[0019] The use of a, sequence label, in the switch address system would allow switching to any/all of the 256 image switch elements in any sequence, with each address operation. By including a, sequence plus time index label, the potential submillimeter alphanumeric image string can become extremely long for each address operation.

[0020] The advantage of submillimeter image switches would be the increased efficiency of directly switching, transmitting, manipulating, and storing information as submillimeter images of alphanumeric symbols or scenes, without the archaic conversion into binary code and the subsequent decoding.

Summary:

~~Miniscule images, of alphanumeric~~

[0021] Submillimeter information symbols or scenes formed on MEMS mirrors and/or the exit mirrors of laser diode arrays and the like, allow these devices to function as submillimeter information image switches, producing a string of laser light pulses, each an image of a submillimeter information symbol or scene. These switches ~~are created for use~~ would be used in optronic/photonic devices and systems/networks.

Description:

[0022] Submillimeter information symbols or scenes, (reflective or ~~alphanumeric symbols~~ nonreflective, positive or negative), are etched or formed onto the mirrors of MEMS switches and/or the exit mirrors of laser diode arrays and the like (other optical switch devices including liquid crystal devices). By selectively switching which MEMS mirror reflects a laser light pulse *(submillimeter)* or which laser diode emits a laser light pulse *(submillimeter)*, these devices function as submillimeter image switches.

Operation:

[0023] A light pulse *(submillimeter)*, reflected or emitted from a ~~marked mirror~~ *submillimeter image* switch element would form a *submillimeter* ~~mirror~~ image of the symbol(s)/scene(s) on that element. *These pulses could be ultra-short(femtosecond) and each pulse, a discreet, separate, and different image.* The light pulse image*(s)* could be directed into an optical fiber for transmission. Projection of the light pulse image*(s)* onto a CCD chip (or screen) would provide

readout. Storage might be recording of the symbol image*(s)* ~~projection~~ directly onto a CD (or with light stopping methods of Rowland Institute).

Conclusion, Ramifications and Scope:

[0024] The limiting factor may be the number of photons necessary to form an image. Many paths toward that limit appear possible: for example, extremely small symbols, extremely short light pulses, multiple symbols on each ~~mirror~~ switch element, lens systems, very high element number switches; i.e. current MEMS switches have 256 mirrors (possible symbols), frequency multiplexing; i.e. each frequency of the light pulse forming an image, and reflective symbols on a nonreflective background. Alternatively: symbols might be formed directly onto the exit mirrors of *submillimeter* lasers such that the laser pulse, itself, is the image; or *submillimeter* images created by passing the light pulse through a *submillimeter, liquid crystal* image medium.

Eventually, a *submillimeter* image may be worth a thousand bits.

[end of marked up version]

Comment: The Applicant wishes to convey appreciation and gratitude to the Examiner for diligence and assistance. Thank You!

Conclusion:

In the view of the Applicant, the above Amendment B in Patent Application Number 09/784,773 conforms to the 2002, April 2 Office Action and to the 2002, August 7 Office Action.

Request For Constructive Assistance:

The Applicant requests, with all due respect, the assistance and suggestions of the Examiner, pursuant to M.P.E.P. | 2173.02 and | 707.07(j), to place this Application (# 09/784,773) in allowance.

Very Respectfully:

Joseph D. Udy, Applicant Pro Se

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Certificate of Mailing

I hereby certify that this Amendment B in Patent Application Number 09/784,773 and referenced attachments will be deposited with the U.S. Postal Service by Express Mail, in an envelope addressed to "Box AF, Commissioner for Patents, Washington, DC 20231" on the date below.

Date: August 27, 2002

Inventor's Signature: Joseph D. Udy